



Assessment of the public debate on the development and regulation of nanotechnology

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On 23 February 2009, the National Commission for Public Debate (CNDP) was charged by the French Government with the organization of a public debate to examine the general options for the development and regulation of nanotechnology. This debate was in line with a commitment made at the Grenelle Environment meeting, and was referred to in the law regarding policy implementation¹.

The seven Ministries, respectively responsible for Ecology and Sustainable Development, Economy and Industry, Employment, Agriculture, Research, Defense, and Health, who jointly commissioned this public debate also constituted the collective authority throughout the course of the debate.

From the Government's point of view, the objectives of the debate were to focus on themes that would lead to the responsible development of nanotechnology and make it secure, and to respond to the queries voiced by diverse stakeholders, both professionals and citizens, about uses and consequences. The Government expected the debate, after analysis of the benefits and risks of the different applications - particularly as regards public health and the environment - to provide guidance on the national policies to adopt in the following domains: support for nanotechnology research and innovation, assessment of exposure and toxicity evaluation, information and protection for workers and consumers, watchdog and supervisory measures, and governance. The general public was thus invited to take an active part in elaborating the relevant decisions.

On 4 March 2009, the CNDP decided that this debate should go ahead, and nominated an ad-hoc public debate commission (CPDP), chaired by Mr. Jean Bergougnoux. The CNDP then nominated the other members of the CPDP, as proposed by Mr. Bergougnoux : Ms. Galiène Cohu, Ms. Isabelle Jarry, Ms. Marie Pittet, Mr. Jacques Arnould, Mr. Jean-Pierre Chaussade, Mr. Patrick Legrand.

Preparation stage of the debate

Broad coverage of French territory

The CPDP first contacted the stakeholders involved and identified with them the key topics requiring investigation. Although nanotechnology has already been the subject of various forums, round table meetings, exhibitions or public discussions², it was apparent that the public at large knew little about this technology, its applications and the questions that it raises, probably due to insufficient media coverage of the issue.

The CPDP arranged therefore to meet the public, in 17 towns where industrial sites manufacturing nanoproducts already existed, or where research was underway in nanoscience or nanotechnology laboratories. Each meeting aimed to examine technical aspects and their effects locally, along with a more general topic. This nationwide approach, while it did inform people about the development of nanotechnology in their specific area, also made it difficult for the general public to appreciate the entire range of the general topics, which were examined successively in the various towns.

1. Article 42 of Law n° 2009-967 of 3 August 2009 states : "The use of substances composed of nanoparticles or of materials containing nanoparticles will be the subject of a public debate held on a national scale before end 2009. The Government's objective being that, within two years after promulgation of this law, any manufacture, import or sale of nanoparticle substances or of materials that can discharge such substances, under normal or reasonably predictable circumstances, must be reported to the relevant public authority, particularly as regards quantities and uses. In addition, the general public must be informed, so that the risks and benefits of these substances and products can be assessed. The Government will make sure that workers are fully informed by their employers about the risks and measures required to ensure their protection."

2. Particularly the Nanoforum set up by the National Centre for Arts and Crafts (CNAM), round table meetings and an exhibition organized by the Science and Industry Museum, and a citizens' conference held by the Regional Council for the Greater Paris Area.

In preparing the debate, the CPDP was backed up by a group of experts to help it to grasp the various scientific questions which were likely to come up. Another group composed of 15 people, chosen by the French Institute of Public Opinion (IFOP), participated so that specific questions and reactions from the general public during the debate could be dealt with.

Multiple sources of information

The CPDP played a part in the preparation by the Ministries of the document presenting information for use during the debate, divided into four parts:

- Status report outlining actual or potential applications for nanotechnology, as well as the risks that it could carry for public health and the environment;
- Presentation of social and ethical issues;
- Conditions required for controlled development of nanotechnology, particularly governance and regulation;
- Future prospects in view of a responsible approach to the development of nanotechnology.

All these issues came up during the debate. However, one basic issue was missing from the debate agenda, i.e. is the development of nanotechnology useful and/or desirable, and this was pointed out by certain opponents. On 2 September 2009, the CNDP considered that the debate presentation document was sufficiently detailed to proceed with the public debate, which was scheduled to take place between 15 October 2009 and 24 February 2010.

The debate schedule was presented to the press on 23 September 2009. On this occasion, the Minister of State for Ecology, Energy, Sustainable Development and the Sea, expressed himself in these terms: “Nanotechnology is a major revolution that lies before us and I do not wish this revolution to be handled by the experts alone. The debate aims to allow all our citizens to have their say in setting the fundamental options for the future of society.” These words set the tone.

The CPDP chairman set certain targets for the debate, specifically 10,000 participants in the public meetings, and several hundred thousand website hits.

Debate timetable

The debate was confronted with increasingly noisy disturbances, and did not meet with the success expected, with the exception of the 51 stakeholder submissions. Upon closure, 3216 people had taken part in the public meetings, 75 communications were presented, 661 questions were posed, and 169,717 people had visited the website. What went wrong?

First of all, the wide scope of the subject. Nanotechnology covers too wide a range of subjects, and its meaning is not clear to the public. The public, being broadly unaware of the issue, came to the public meetings more to obtain information than to participate in a debate. If time had not been so short, a preliminary information campaign should have been organized in order to raise the public’s interest in the various topics involved, and thus incite them to participate in the debate. The press releases, posters or flyers prepared by the CPDP were not sufficient in mobilizing the public.

Was the debate opportune? What is nanotechnology used for? Do we need it? Although the notions of utility or futility of the applications were often debated, the question of final objectives was not fully examined. The position of the authorities was clearly in favor of a responsible

approach to nanotechnology development and excluded *a priori* any suspension of, or moratorium on, nanotechnology. What was the point, certain people asked, of having a debate if it did not centre on the questions posed by society in the face of progress, and the relationship between science and society?

The topics under debate were highly scientific. Not for the first time we were made aware of the fact that in France we have a real problem in communicating on the subject of science. Scientific researchers are at times out of touch with the philosophical problems raised by their own research. The CPDP's choice of experts to sit at the debate table during the public meetings may have accentuated this difficulty. In Clermont-Ferrand, one participant in the debate hall stated: "We do not need the advice of experts to hold a debate. Nanotechnology is not a matter for experts, but is a social matter, a political matter", and someone else added "a philosophical matter".

Debate timing was also a problem. Coming at the same time as nationwide debates concerning national identity or the burqa, the debate about nanotechnology was not given much space, even though the press became interested in both the content and the form³ once the debate had started encountering disturbances. Also, for certain stakeholders, the debate occurred too late in the day, since hundreds of products are already on the market in the absence of adequate regulations, and public funding of research has already been put in place.

Above all, there was opposition to the debate. Radical opposition to holding the debate at all, initially underestimated, contributed to giving a completely distorted image of the public debate concept. It was doubtless difficult to mobilize the public to attend meetings which had a fair chance of being brought to a standstill. Meetings held in Lille, Grenoble, Rennes, Lyon and Marseille incurred major disturbances. Those planned in Orsay, Montpellier and Nantes were cancelled and replaced by debates via the internet. This solution which aimed to compensate for cancellation was criticized, particularly by the media who said that it could not be called a public debate.

Certain associations who assiduously attended the debate, and who were often seated on the panel of experts - such as Consumer Affairs, Housing and Lifestyle (CLCV), FO Consumer Rights Association, France Nature Environment Federation, and trades unions – protested loudly at times along with members of the public, against these disturbances. When these associations were seated on the panel, they did however continue to advance the debate despite the disturbances, thus ensuring that a balance of opinions was maintained, to which the CPDP was constantly attentive. One can only regret that the association Friends of the Earth, who had drawn up a submission and participated actively at the beginning of the debate, decided to withdraw since it considered that the conditions necessary for a public debate were no longer met.

Opposition to nanotechnology turned into opposition to the debate

Opponents justified their opposition by claiming that the public debate was a sham since Governmental decisions had already been made and were on-going during the debate, and that the debate had been organized with one objective in mind, that of promoting nanotechnology. It is clear that when the commissioning authority announced certain decisions during the debate, implying that they were not really taking the procedure seriously – on top of the fact that the debate was organized at their request - this greatly handicapped the work of the CPDP.

3. By the end of the debate, media coverage totalled 1115 entries, of which 515 in the press, 130 on television or radio, 470 on the internet.

It is true that this was not the first time that disturbances had occurred during a public debate, leading a public meeting to be curtailed or cancelled. In this case, opposition to even holding the debate at all led the CNDP to seek other forms of organization, using the internet, so that all those who wished to make a contribution could do so. But one must admit that this solution invited criticism, frequently revealed and relayed by the press: “the public debate without the public has now been invented”, “the virtual debate”.

Even if experience shows that conflicting points of view can be difficult to handle, nothing can justify a dispute that renders dialogue impossible. Is punctuating the meeting with comments like “stuff the debate, we just don’t want nanotechnology”, and “participating means accepting”, a valid reason for denying freedom of speech? Paradoxically, the disturbances drew the attention of the media world, and maybe such a keen interest would not otherwise have been shown in the public debate. On the other hand, the media mainly echoed the opinions defended by the opponents to the debate.

The positive side of nanotechnology

According to the National Centre for Scientific Research (CNRS) and the Atomic Energy Agency (CEA), one objective is to contribute to developing a society that puts less pressure on natural and energy resources, whilst upholding high standards for preservation of health and the environment.

In the medical field, according to the National Institute of Health and Medical Research (INSERM), nanotechnology is a cause for hope since it allows medication to aim directly at its target, particularly for cancer therapy. Brain diseases can also be cured thanks to electrode miniaturization, by implanting them directly in the central nervous system.

For the Academy of Medicine, the most spectacular progress would be made in diagnosis accuracy and in treatment effectiveness. Nanotechnological techniques would provide fast, reliable, ultrasensitive and inexpensive diagnoses, based on data made available by an increasingly specialized network of microarrays and molecular markers. Thus we can see the beginnings of what the future may hold, i.e. the key to truly personalized medical care, increasingly tuned to the particularities of each individual.

In a time of economic crisis, nanotechnology would be for French and European business an opportunity to retain competitiveness. The economic perspectives for a market that will be worth one billion dollars in 2015, together with the current position of France (fifth in the world for research in this sector), are sufficient reasons for stepping up the research effort.

Why is the development of nanotechnology feared?

No-one can deny that we are still very much in the dark about potential health risks, about impacts on the environment or individual liberties, or about the possible uses in security devices, and this can explain many of the fears expressed during the debate. The issue of risk was omnipresent throughout the debate process. Also, the invisible nature of nano-objects reinforces further the worry and mistrust produced by them.

In the medical field, if it is possible to repair the human body as explained above, why not improve it one day, enhance its performance, thus giving substance to the fear of a possible drift towards transhumanism. It is a fact, to quote the submission prepared by Friends of the Earth, that health and environmental risks have been neglected up to now, and studies into recognized environmental risks have been too vague.

Are intelligent objects on their way, facilitated by NBIC-convergence (nanotechnology, biotechnology, information technology and cognitive science) which some people fear carries major risks? Is there any risk of damaging DNA? The Academy of Medicine underlined two problems. Firstly, the biological definition of each individual would lead to the best medical care, but it would be unacceptable to allow this personal information to be accessed either by state authorities or by other members of society. Secondly, is it advisable or dangerous for an individual's health that he or she be aware about personal biological characteristics? How can we make sure that the development of nanotechnology will not bring hyper-traceability of people and things in its wake, compromising the liberty to come and go, and the right to anonymity, due to the increasingly intensive use of Radio Frequency Identification .

In addition, and this point was often brought up, how can one know if purchases contain nanomaterials or not, since it would appear that over one thousand products already on the market contain them (cosmetics, packaging, vehicle tires, tennis rackets, and even shoes...). And what happens to medicines after use, how can the questions of substance recycling and nanotechnology waste management be dealt with?

Other questions centered on who was in charge of industrial strategies, and how these could be controlled. What sort of governance is planned and how far do we take the precautionary principle? In short, "what sort of society do we want?" was a question asked time and again during the debate.

Why is nanotechnology criticized?

Criticism is widespread and clearly does not just exclusively emanate from the most radical opponents. Even though professionals already using nanomaterials approach the subject in more reassuring terms (the federation of beauty product companies states in its submission that it is "a pioneer in overseeing nanomaterials"), more critical opinions have been advanced by researchers, scientists, associations for the protection of the environment or consumer groups, representatives of assessment boards or ethical committees, who emphasized the necessity to undertake a thorough risk/benefit analysis. One must admit, however, that these same groups could have been more forthcoming about providing information.

Hence, certain people tend to deplore that 'it is too late, and our fate has been sealed', and that we are now presented with a *fait accompli*.

For several years, the sector has been undergoing vast transformation (not only in France with, for example, the creation of Minatec in Grenoble, or the introduction of the Nano-INNOV plan, but also abroad), and certain people are now greatly mistrustful due to the silence of the state authorities about having given their go-ahead.

One thing that came as a surprise was that many official agencies are already in a position to give an opinion, and they do so: French Agency for Health Safety in the Environment and Workplace (AFSSET), INSERM, CNRS, French Agency for Health Safety of Health Products (AFSSAPS), French Standards Association (AFNOR), CEA, National Institute for Industrial Risks (INERIS), National Commission for Data Processing and Liberties (CNIL), National Institute for Agricultural Research (INRA), French National Institute for Research in Computer science and

4. An RFID search using a well-known web search engine supplied almost 14 million responses.

Control (INRIA), National Institute for Consumer Affairs (INC), plus various ethical committees, ministerial departments, research centers and university laboratories... If nothing, or very little, seems to have been reported over the past few years, maybe we are right in wondering whether there is any coordination between them (even if the CNRS and the CEA have stated that they are working together) and if their opinions carry any weight.

It was also pointed out that, in this sector, the time-lag between knowledge and practical applications is far too short, and the requisite time needed to evaluate risks is not allowed. Is it not necessary to give these things more time so that risks can be properly evaluated? Weak French potential as regards toxicological and eco-toxicological research and monitoring is also perceived as a major handicap.

Lastly, on the global scale, the development of nanotechnology is likely to increase the development gap between Northern and Southern countries.

What proposals are put forward?

State representatives repeated on several occasions that this debate showed that the Government was serious about promoting economic and technological development which also takes the preoccupations of the French people into account. If certain decisions have already been made, much more remains to be decided. The presentation document initiating the debate proposed several working options. Had the debate helped to enlighten them?

Despite the difficulties met during the course of the debate, numerous proposals were put on the table. However, these were not particularly innovative considering the content of the submissions that had been prepared by various stakeholders. It is not possible in this summary to provide the details of all these proposals, but they can be found in the full CPDP report. Certain proposals will be described however since a consensus or at least broad agreement was reached for them, whilst for other proposals, opinions remained divided.

Acquisition and communication of knowledge

The debate underlined the consensus about the necessity to make an inventory of nano-substances and to publish information widely, precisely and continuously. Information on the characteristics and possible consequences of these substances is to be made accessible to all. It is a fact that a large proportion of visits to the CPDP website were motivated by the desire for more information. The debate helped to make this information available which was well reported by the press, but this need for information will gain momentum. The authorities will be obliged to set up the necessary procedures for the enlightenment of our fellow citizens.

A national inventory for radioactive materials and waste has already been made public. Why not introduce a similar procedure here, as suggested for example by the French Confederation of Christian Workers (CFTC)? Why not create, as proposed by the Government, a nanotechnology website for access to all the public and private documents available on the subject of nanotechnology?

There was widespread agreement during the debate about nanoparticle traceability, so that these products can be located and information obtained about them. Risk evaluation and control can only be effective if a precise and thorough inventory of existing nanomaterials is made. Increased

transparency and traceability are thus considered to be priorities, so that these nanomaterials can be described in detail then monitored at design, production, and market launch stages.

For France Nature Environment Federation, these products do not necessarily need to be proscribed, but their use must be clearly defined, highly regulated, and inadvertent use of them throughout the life cycle must be avoided. As suggested by the Public Health Research Institute, this would also allow identification of all the companies involved. The state authorities pointed out that the Senate has voted for a compulsory declaration of nanoparticle use to be made by industrial companies.

Agreement was also reached on a system of labeling which would contribute to informing consumers. The field of application needs to be defined as to characteristics and procedures, so as to ensure that clear information is passed on to consumers. Another proposal was to create a local watchdog group (CLIS), or a local committee for information and concerted action (CLIC), in areas and industrial sites where nanotechnology is being used. If there is to be a dialogue between science and society, citizens will need access to more information. It was unfortunate that the Ministry of Education did not sign the official letter commissioning the debate, since the teaching of science will rapidly need to cover both the nanosciences and their applications. The shortcomings of scientific training in schools, and the need to train more young people in technological fields, were underlined.

Evaluation : increase research for more effective benefit/risk analysis

It was often deplored during the debate that only 3% of the state budget for nanotechnology research is currently used to study the risks involved, since almost all funding goes toward product development. A proposal was formulated to step up fundamental research programs on the biological effects of nano-objects, especially if worrying facts regarding public health start appearing.

In this respect, the European Union Reach regulation is a real achievement in that it requires industry to provide health and environmental safety data about all chemical substances produced or marketed in Europe in excess of 1/t per year, and that the guiding principle is “no information, no market”. As things stand, this procedure usually does not apply to nanomaterials because they are often produced in quantities under 1/t per year, and regulations do not explicitly differentiate between nanoparticle substances and larger sized substances. Even though, by using one chemical formula, it is possible to obtain several different forms of nanoparticles, with different physicochemical properties according to size. A consensus emerged requiring the Reach regulation to be adapted to nanomaterials, defining them as a new type of substance and changing the tonnage criterion.

The particularities of nanoparticles make toxicological studies difficult and manifestly inadequate. Description and knowledge about aggregation, sedimentation and interaction between nanometric substances are required before a proper evaluation of their eco-toxicological properties can be made. What action is required when so much remains unexplored?

A total of 7000 researchers in France are working on the nanosciences and nanotechnology, of which 6500 are employed by the CNRS and the CEA. Thus, since research is mainly state-funded, a minimum requirement would be to provide for compulsory work on toxicological and environmental aspects in the convention linking these institutions. This work would focus on the nanoparticle life cycle and on ways of recuperating and processing waste. Another

requirement would lead to a much higher proportion of the overall state research budget for nanosciences and nanotechnology being allocated to research into toxicity and impacts. Resources could eventually be pooled after creation of an agency on the European level.

For some people, nanotechnology presents certain benefits, particularly for health, but the risks it carries are so obscure that the only sensible solution would be to put everything on hold, at least until the doubts have been allayed. At this point, the two conditions for invoking the precautionary principle were mentioned, i.e. scientific uncertainty and the probable existence of grave and irreversible risks. Which led certain associations to demand a moratorium, either partial, or total, and to proclaim that public priorities should be placed first and foremost on reducing pollution, preventing cancer, reducing energy dependence, facilitating access to water and food – before developing nanoproducts which have yet to be controlled by any proper supervisory or ethical authority.

Education and training: eliminating manifest weaknesses

After such a debate, it would be beyond comprehension if major research efforts were not undertaken in metrology, toxicity, and eco-toxicity. Thus, a vast education and training program must be set up if the necessary human potential is to be available (France lacks toxicologists and epidemiologists) for research focusing on the nanoparticles most often used in the marketplace, i.e. the nanoparticles in contact with the human body (medicines, cosmetics, textiles, food), and on the different stages in the nanoparticle life cycle. Much remains to be achieved regarding the metrological description of nanotechnologies according to their forms, sizes, and physicochemical compositions. We can rely on neither techniques nor experience : the task is immense, and so are the means required to achieve it.

Protection : increasing worker security

AFSSET pointed out that there are currently no specific regulations for protecting workers exposed to nanomaterials manufactured in their workplace, and that nanoparticles should be considered as potentially dangerous. These nanoparticles should be evaluated on the basis of existing legal texts which put prevention first.

Identification and evaluation of risks should be undertaken well before the industrial manufacturing stage. AFSSET recommends reinforcement of prevention measures, advocates the creation of a good practice guide, and suggests that individual exposure to nanoparticles should trigger an on-going traceability procedure for the individual's entire professional career.

Since nanomaterials travel around from company to company, all people working for these companies should be informed and consulted through the Committees for hygiene, security and workplace conditions (CHSCT). If companies manufacturing nanomaterials share an industrial site with other industries, then joint CHSCTs should be created for the site. In the absence of detection techniques for nanomaterial traceability - which should be an immediate research priority - the compulsory report to the authority created by law on 3 August 2009 is the only current guarantee that information is passed on by companies to their workers.

In addition, as suggested by the National Institute for Occupational Health and Safety (INRS), it would be advisable to develop a precautionary procedure and adopt prevention strategies in all relevant professional environments as well as throughout the products' life cycle.

Guaranteeing individual and collective liberties

The debate about the potential dangers of nanotechnology was not restricted to just health and environmental risks. The debate also led to discussions about the danger to individual liberties that could be caused by the development of these technologies, as well as possible ethical problems connected with transhumanism posed by the creation of devices for increasing human abilities.

On this subject, the CNIL is concerned – and they are not alone – that nanotechnology will bring about a revolution comparable if not greater than that caused by the development of the internet. Nanotechnology will allow objects to be made on an atomic scale, like the practically invisible RFID nano-chips which almost defy detection. Nano-chips could soon be implanted into the human body. How can we control what we cannot see? Information technology is becoming imperceptible due to miniaturization. Nanotechnology is ubiquitous, and massive dissemination combined with the possibility of communicating with objects at a distance, could considerably increase the capacity to gather personal data and to render people and things “hyper-traceable”. In its watchdog capacity, the CNIL feels that it should be responsible for assessing the degree of personal data processing that can be applied when nano-objects are used for communication, and for authorizing this procedure, as it already does for biometric devices. Certain stakeholders attending the debate, particularly the unions, asked for CNIL funding to be increased.

But NBIC-convergence has opened up new research fields regarding the human body, especially the brain. These technologies, which have proven effective in organism repair, can also be used to improve human capacities. Certain improvement techniques are already being used, such as doping, vaccination, surgery, but they are subject to control. This is an area where regulation is eagerly awaited. According to the CNIL chairman, a change in degree effectively changes the nature of things, and he feels that a possible ban on certain uses such as communication implants may prove necessary.

Planning for ethical control of nanotechnology development

Nanotechnology development, such as it occurs today, is the first instance in which consumer products, containing nanoparticles, are put on the market with no preliminary studies about toxicology and product elimination at the end of their life cycle. In such a situation, the question is whether society is capable of properly controlling technological progress, not by putting it on hold, which would be illusory, but by safeguarding security and ethical principles during the course of development.

Advocates feel that responsible development is crucial in the field of nanotechnology, due to its huge economic potential. Given that the risks involved are uncertain, can transparency of information increase security without harming the innovation process? Official statements need to be made but lessons should be learnt from previous health crises. Until product innocuousness has been proven, the precautionary principle should be applied if product marketing is to remain responsible.

Towards a new form of governance

For the general public, nanotechnology is mysterious and its sphere remains vague. Most of the questions covered information, protection, and motivation. How are decisions made, what are the respective roles of the Government and the marketplace in managing innovation policy, what

control do we have, and who is in charge? The question of governance, irrespective of the main theme of each public meeting, always came up, and the same conclusion was drawn each time that, up until now, governance had been neither democratic nor up-front. Since trust is lacking, vigilance and transparency remain the best means for coping with unforeseen risks, for limiting them and regulating them.

The Government is called upon to take its responsibility, particularly regarding research orientation and regulation, but researchers, companies, doctors, and associations must also be held responsible, and each and every citizen must remain vigilant.

As for the question of governance... Every science can be open to drift. Is nanotechnology more so than others? The worries expressed during the debate, whether regarding toxicity or individual liberties, bring us back to the fundamental point of scientific and technological development. Nothing is ineluctable. Progress does not necessarily improve the human condition, but man is capable of evaluating and making choices between what is useful and what should be discarded. As regards nanotechnology, a distinction must be made between the various fields of application: nanomaterials do not pose the same questions as nano-medicine or nano-electronics.

Some recommend the creation of a new authority in charge of governance, including representatives of the various types of stakeholders. This authority would be a watchdog organization with an independent mandate to validate strategy orientation and control measures, standards and evaluation procedures. It would liaise with a similar authority on the European level. Although no formal commitment was made, representatives of the ministers having commissioned the debate did not disagree with these proposals, they had indeed mentioned them as possible working options in the debate presentation document.

Other people are in favor of either a total moratorium, covering both fundamental and applied research, or a partial moratorium covering applications only.

Regulation: on a national or European scale?

It is a well-known fact that nanoproducts are circulating freely within the European market. Thus, everyone agrees that if regulation is to be effective, it must be European. However, there is also the feeling that the European Union is lax at times. So the question of overlap, at least temporarily, of national regulations and European regulations, should be taken into consideration. But if the plan is to introduce a compulsory report before manufacture and marketing in France, will this be compatible with European legislation? It has been suggested that exchanging views on this issue could justify the creation of a European observatory for technological developments.

What lessons can be drawn from this debate?

The debate took place

The debate was necessary. It met with difficulties, but this could have been foreseen in view of the subject and, despite the ups and downs, it ran its course and was useful. The debate sparked greater media coverage of nanotechnology, and this in turn contributed to a much greater awareness. The debate will mean that nanotechnology will henceforward be discussed differently, and this is already becoming clear. The CPDP is to be congratulated on this result, and I wish to thank the CPDP chairman, and the other members of the commission, who managed to stay the course with determination and conviction, despite all the difficulties and criticisms they encountered.

The limited participation of the general public, of elected officials, of researchers and business leaders, was a disappointment, and one wonders if the method was at fault. How can the ordinary citizen make his or her voice heard when discussing highly complex technical and scientific issues? In the absence of the public, the debate turned into a discussion among experts or well-informed stakeholders. On the other hand, the depth of the discussions and the diversity of opinions which were aired within this small circle were of the highest quality.

But when members of the public did express opinions, they clearly expected to hear arguments both for and against nanotechnology, and had decided to exercise their rights regarding vigilance. One of the merits of the debate was to pinpoint the fears and worries of the general public, and of associations and certain groups who are opposed to the arrival of nanotechnology in daily life.

The public debate took place at a crucial time, just as manufacture and marketing of nanotechnology products is gathering speed and risking - should health or environmental problems occur - total rejection of nanotechnology by the general public. The debate could not have happened at a better time.

But the debate is not over

At the end of the debate the themes had been put on the table, rather than actually debated. The issue was too vast to be dealt with in such a short time. But let us not be mistaken: for years to come, nanotechnology will be the subject of a debate within society, so the debate process will have to be fine-tuned by focusing on topics such as consumer information, credible scientific expertise, or the ethical problems connected with individual liberties and with the improvement of human capacities.

This debate has given the public an appetite for information that henceforward must be satisfied. One expectation in particular stood above all others: that of open and responsible governance, for dealing with regulations on national and European levels with the adequate expertise and funds, and for organizing a true partnership between science, research and society. Will a society that relies on the development of increasingly powerful technology be a better one or not? It is up to us to decide.

Lessons to be drawn by the CNDP

In view of the difficulties encountered during the debate, certain questions need to be answered when the CNDP is charged by the Government with organizing debates about issues affecting society:

- How can refusals on the part of certain people to participate in the debate be dealt with, including the form these refusals can take? How can we respond to criticism of the public debate process, which in actual fact was an excuse to pour criticism on the projects themselves?
- Is it not advisable to restrict the scope of the debate and to specify more fully what the Government seeks to learn from the debate, and also what results we should be aiming for?
- Certain things need time. In the short space of time imposed by constraints that were not connected with local democracy, it was not easy for the CNDP to organize a debate, especially when the debate was also expected to provide information to citizens about such a complex subject. We received this message loud and clear. It is imperative that the CNDP remain in

charge of the timetable which it feels is most appropriate to carry the exercise to completion. This is why, in the case of issues where the general public is clearly under-informed, a preliminary information phase before the debate appears to be indispensable. If not, the discussions tend to take place among specialists, far removed from the public and their own preoccupations.

- How can we get the debate commissioning authority to abstain from any declarations or decisions while the debate is underway, since these invite criticism according to which “all the decisions have already been made”. Nothing can undermine more the usefulness of the debate than off-the-cuff announcements of decisions that anticipate the lessons that could have been drawn from the debate.
- Make sure that the general public deals with one sole contact. When the commissioning authority has too many heads, as the CPDP chairman put it, then this can only complicate matters in transmitting the message to the public.
- How can we use internet potential more effectively? The internet played a significant role during the debate. Could we have used it better or more?

Generally speaking, the expectations and requests formulated during the debate matched the working options mentioned in the initial debate presentation document. This shows that the time is ripe for decision making. The statement issued at the Governmental meeting held on 14 October 2009 on the subject of research and the public debate on nanotechnology, concluded thus: “At the end of the debate, a report and assessment will be established and the Government will make public its intended course of action.” I cannot stress enough the impatience of the public to learn what this course of action will be, in both scientific and technical fields, in both social and political domains.

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